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(54) BAR CODE DEMODULATION SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a bar code demodulation system that can accelerate demodulation speed.

SOLUTION: The bar code demodulation system comprises a data table generating means 1 for converting the dot pattern of a bar code into a data table where the pattern is expressed by dot numbers corresponding to each bar width in order of arrangement, and a demodulating means 2 for demodulating the bar code according to the data table. The data table generating means 1 further comprises a delimiting means 1a for delimiting every n dots of the input dot pattern to generate a plurality of partial dot patterns, a storing means 1b for storing a dot number table where every combination of white and black bars constituting the dot patterns of n dots is expressed by dot numbers corresponding to each bar width in order of arrangement, and a converting means 1c for using the dot number table to combine the plurality of partial dot patterns generated in the delimiting means 1a together while sequentially converting them into dot numbers corresponding to each bar width and thus to generate the data table.
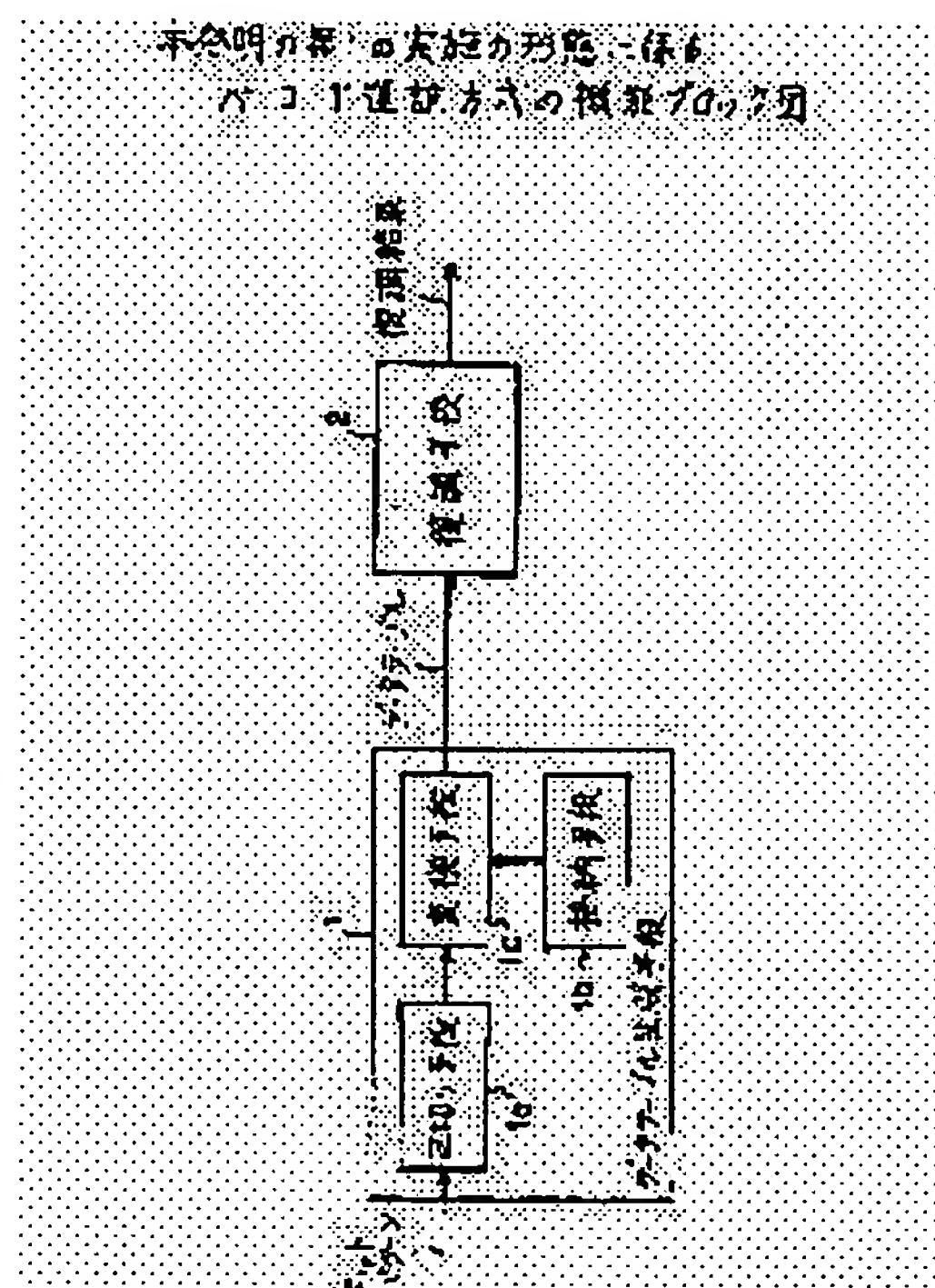
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* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the bar code recovery method for restoring to the dot pattern which reads a bar code with a bar code reader etc., and is obtained.

[0002]

[Description of the Prior Art] Usually, the dot pattern of a bar code consists of binary data of "0" and "1" corresponding to the white bar and a black bar, for example, and the dot of the numeric value ("0" or "1") only with the same number corresponding to each bar width of face will continue.

[0003] Therefore, by the conventional recovery method, each bar width of face is judged and it is made to get over by counting flatly in order how many "0" and "1" are continuing in a dot pattern based on it. That is, while the numeric value for 1 dot was taken out one by one, shifting 1 dot of dot patterns at a time to the left or the right and it judged "0" and "1", it was the method which counts the number.

[0004]

[Problem(s) to be Solved by the Invention] However, in the present computer currently used for the recovery of a bar code, shifting 1 dot at a time as mentioned above is the processing which time amount requires specially. Therefore, there was a problem that a recovery rate was slow, by such conventional recovery method. It becomes remarkable, so that the number of dots of a problem [such] of a dot pattern increases.

[0005] This invention makes it a technical problem to offer the bar code recovery method which enables improvement in the speed of a recovery rate in view of the above-mentioned conventional trouble.

[0006]

[Means for Solving the Problem] This invention is constituted as follows, in order to solve the above-mentioned technical problem. That is, the bar code recovery method of this invention is characterized by having the data table generation means which a white bar and a black bar change into the data table having shown the dot pattern of the bar code arranged by turns in accordance with that array sequence with the number of dots corresponding to each bar width of face, and the recovery means which restores to the above-mentioned bar code based on the data table obtained with this data table generation means.

[0007] According to this invention which consists of such a configuration, it once changes into the data table having shown the dot pattern with the number of dots corresponding to each bar width of face. Since each bar width of face is equivalent to the number of dots which "1" or "0" follows, if it is a dot pattern as shown in "0011100001100", the data table [white 2 black 3 white 3 black 2 white 2] will be obtained, for example. Then, based on the data table obtained by doing in this way, it will restore to a bar code.

[0008] Since the processing which time amount which counts the number requires becomes unnecessary, shifting 1 dot of dot patterns at a time like before when it does in this way, compared with the former, a recovery rate is accelerated sharply.

[0009] the above data table generation means -- for example, the dot pattern of the above-mentioned bar code -- n dots (n -- two or more integers --) A break means to divide into every [of 2] multiple,

considering especially computer processing, and to generate two or more partial dot patterns, A storing means to store the number table of dots having shown the dot pattern which consists of n dots in accordance with the array sequence with the number of dots corresponding to each bar width of face for every class setting the white bar which constitutes this, and a black bar, By joining together mutually, carrying out sequential conversion of two or more partial dot patterns generated with the above-mentioned break means at the number of dots corresponding to each bar width of face using the number table of dots stored in this storing means It is possible to have and constitute a conversion means to generate the above-mentioned data table.

[0010] If it does in this way, since it will become possible to create the above-mentioned data table simply using the above-mentioned number table of dots prepared beforehand, much more improvement in the speed of a bar code recovery is realized.

[0011] With the above-mentioned recovery means, if the data table generated as mentioned above is used, a recovery will become possible by various kinds of approaches. For example, the pattern table having shown the dot pattern corresponding to each character with the number of dots like the above-mentioned data table is prepared beforehand, and it is possible to get over out of this pattern table by discovering the character corresponding to the data table obtained with the above-mentioned data table generation means.

[0012] Moreover, the above-mentioned recovery means can also be got over as other much more desirable modes based on the bar width-of-face ratio expressed with the size relation of the number of dots of same color bars in a mutually different location which constitutes the data table obtained with the above-mentioned data table generation means.

[0013] Thus, if it is made to get over based on a bar width-of-face ratio, it does not need to be influenced [of the so-called contaminant data] like the dot transformation produced by the fine blemish made, for example on the bar code front face.

[0014] The recovery means which gets over based on such a bar width-of-face ratio For example, a comparison means to compare the size relation of the number of dots of the above-mentioned same color bars, A classification means to classify the dot pattern corresponding to each character into two or more groups based on the size relation of the number of dots of same color bars in a mutually different location which constitutes this dot pattern, A group decision means to decide the group corresponding to the data table obtained with the above-mentioned data table generation means based on the comparison result by the above-mentioned comparison means out of two or more groups classified according to the above-mentioned classification means, Within the group decided with this group decision means, the pattern table showing the dot pattern of a proper in each character can be searched, and it can have the retrieval means which discovers the character corresponding to the above-mentioned data table obtained with the above-mentioned data table generation means, and can constitute.

[0015] In addition, the other thing is also employable although the above-mentioned dot pattern is binary data which come to express the dot corresponding to a white bar and a black bar with "1" "0", respectively.

[0016] The incorrect data for 1 dot may be contained in the dot pattern of a bar code. For example, that out of which only 1 dot of whites came to the part which should be a black bar essentially is called "void", and that out of which only 1 dot of black came to the part which should be a white bar essentially conversely is called "spot" (of course, it is a premise that the bar of only 1 dot does not exist in this case). Then, it is desirable to have the coping-with method for the dot pattern which such a spot and the void produced.

[0017] The dot pattern of a bar code Namely, when [for example,] it is the pattern with which "01" exists in the middle of "0" which followed continuous "1", The recovery which considers that this "01" is what is "11" (that is, "0" is a void), and performs it, If the direction which was successful either among the recoveries performed by regarding it as what is "00" (that is, "1" is a spot) is adopted, it can respond to a spot and a void.

[0018] The dot pattern of a bar code moreover, when it is the pattern with which "010" exists in the middle of continuous "1" and continuous "1", [for example,] The recovery which considers that **

"010" is what is "111" (that is, "0" is a void), and performs it, the direction which was successful either among the recoveries performed by regarding it as what is "000" (that is, "1" is a spot) -- ****** -- if it is made like, it can respond to a spot and a void.

[0019] The coping-with method for such a spot and a void can be adopted also as the conventional general bar code recovery method, and it is also within the limits of this invention.

[0020]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail, referring to a drawing.

<Gestalt of operation of the 1st of this invention> drawing 1 is the functional block diagram of the bar code recovery method concerning the gestalt of operation of the 1st of this invention.

[0021] The bar code recovery method shown in this drawing is what is realized by the data processor which consists of CPU, a ROM, RAM, etc. in profile With the image sensors (CCD etc.) of a bar code reader, read the bar code and were obtained. A data table generation means 1 to change into the "data table" having shown the dot pattern which consists of binary data of "0" (white) and "1" (black) in accordance with the array sequence with the number of dots corresponding to each bar width of face, It has the recovery means 2 which restores to the above-mentioned bar code based on the data table obtained with this data table generation means 1.

[0022] The above-mentioned data table generation means 1 consists of break means 1a, storing means 1b, and conversion means 1c further. The above-mentioned break means 1a is a means to divide the inputted dot pattern into every n dot (for n to be the multiple of 2), and to generate two or more partial dot patterns.

[0023] The above-mentioned storing means 1b is a means to store the "number table of dots" having shown the dot pattern which consists of n dots in accordance with the array sequence with the number of dots corresponding to each bar width of face for every class setting the white bar which constitutes this, and a black bar. In addition, this number table of dots is created beforehand.

[0024] The above-mentioned conversion means 1c is a means to generate the above-mentioned data table, by joining together mutually, carrying out sequential conversion of two or more partial dot patterns generated by break means 1a at the number of dots corresponding to each bar width of face using the above-mentioned number table of dots stored in storing means 1b.

[0025] Next, the bar code recovery method shown in drawing 1 is more concretely explained using drawing 2 and drawing 3 . In addition, drawing 2 is a flow chart which shows processing of the bar code recovery method shown in drawing 1 , and drawing 3 is drawing showing an example of a dot pattern, the number table of dots, and a data table.

[0026] In addition, steps S1-S7 of drawing 2 are processings by the data table generation means 1, and step S8 is processing by the recovery means 2.

[Step S1] The data for n dots are first taken out from the inputted dot pattern as a partial dot pattern. For example, it is "011111001111111100100" as a dot pattern shows to drawing 3 (a), and considering the case where it is referred to as n= 4, "0111" of a head is first taken out as a partial dot pattern.

[0027] [Steps S2-S3] By using as a search key the partial dot pattern of n dots taken out at the above-mentioned step S1, the number table of dots currently prepared beforehand is searched, and corresponding data are picked out from the number table of dots.

[0028] Here, as mentioned above, the number table of dots is a table having shown the dot pattern which consists of n dots in accordance with the array sequence with the number of dots corresponding to each bar width of face for every class setting the white bar which constitutes this, and a black bar, and shows the example to drawing 3 (b). This example is a thing at the time of being referred to as n= 4, and the combination of 16 (= 24) passages is shown in all.

[0029] For example, in order that "1" corresponding to black may arrange only one piece after four "0" corresponding to white continues if it is the dot pattern "0001" of 4 dots, "white 3 black 1" is stored in the number table of dots. Moreover, if it is a dot pattern "1011", since one piece and "0" (white) arrange to one piece and "1" (black) is arranged for "1" (black) in two order, "black 1 white 1 black 2" is stored in the number table of dots.

[0030] Therefore, if the partial dot pattern taken out at the above-mentioned step S1 is "0011", the "white 2 black 2" which is data corresponding to this will be taken out by searching the number table of dots by making this into a key.

[0031] [Step S4] Although mentioned later in detail, the data table will be generated carrying out sequential association of each data with which the line was obtained by it one by one from the head of a dot pattern to the tail in the above-mentioned steps S1-S3 by the next steps S5-S7. therefore, the dot of the head of data and the continuation ("the white -> white") of that it is the same color, i.e., "white", and "white" from which the dot of the tail of the data taken out at step S3 was taken out by the last time in step S4 -- or continuation ("black -> black") of "black" and "black" is investigated.

[0032] For example, if it is continuation of "black -> black", and the last data are "black 3 white 1", if the last data are "white 1 black 3" and these data are "black 2 white 2", and these data are "white 1 black 1 white 2", it is continuation of "white -> white." On the other hand, the last data are "black 2 white 2", and since it is "white -> black" case [whose data of these are / like "black 4"], it is not continuation.

[0033] [Step S5] When judged as "continuation" by the above-mentioned step S4, these data are combined with the data to last time after performing an add lump of the continuous number of black dots or continuous number of white dots.

[0034] For example, the last data are "white 1 black 3", and in combining them, if these data are "black 2 white 2", the joint result of "white 1 black 5 white 2" is obtained by adding "black 3" and "black 2" and considering as "black 5." Similarly, if the last data are "black 3 white 1" and these data are "white 1 black 1 white 2", the joint result of "black 3 white 2 black 1 white 2" will be obtained by adding "white 1" and "white 1" and considering as "white 2."

[0035] [Step S6] When it is judged that it is not "continuation" in the above-mentioned step S4, these data are combined with the data to last time, without performing the above add lumps. For example, the last data are "black 2 white 2", and case [whose data of these are / like "black 4"], the joint result of "black 2 white 2 black 4" is obtained by combining these simply.

[0036] [Step S7] The above-mentioned steps S1-S6 are repeated, and the "data table" which finally combined all data and was obtained is generated until it reaches the tail of a dot pattern.

[0037] As sequential association is carried out according to the Ruhr of above-mentioned step S4-S6, for example, a data table shows each data which searched the number table of dots with the above-mentioned steps S2 and S3, and was obtained to drawing 3 (c), it is shown by the number of dots corresponding to each bar width of face which followed in order of the array of the white bar which constitutes a dot pattern, and a black bar.

[0038] For example, when it is "0111110011111100100" as a dot pattern from the first shows to drawing 3 (a) The partial dot data "0111" with which 4 dots of delimiters are obtained at a time one by one in this, "1100", "1111", "1110", and "0100" are used as a search key, respectively. For example, a final data table "the white 1 black 5 white 2 black 7 white 2 black 1 white 2" is generated by searching the number table of dots as shown in drawing 3 (b), and carrying out sequential association of the data "white 1 black 3" obtained by this, the "black 2 white 2", "black 4", the "black 3 white 1", and the "white 1 black 1 white 2."

[0039] [Step S8] Based on the data table obtained as mentioned above, it restores to a bar code. The same method as usual can perform this recovery. That is, if the above-mentioned data table is seen, the same result as the case where carried out like before and "0" of a dot pattern and "1" are counted in order flatly is obtained, and, therefore, the same recovery as usual can be performed. For example, the pattern table having shown the dot pattern corresponding to each character with the number of dots like the above-mentioned data table is prepared beforehand, and it is possible to get over by discovering the character corresponding to the above-mentioned data table out of this pattern table.

[0040] According to the gestalt of the 1st operation described above, a dot pattern can be changed into a data table using the number table of dots, and it can once restore to a bar code based on this data table. Therefore, since the processing which the time amount of counting a number requires becomes unnecessary, shifting 1 dot of dot patterns at a time like before, compared with the former, a recovery rate is sharply accelerable.

<Gestalt of operation of the 2nd of this invention> drawing 4 is the functional block diagram of the bar code recovery method concerning the gestalt of operation of the 2nd of this invention.

[0041] The data processor which consists of CPU, a ROM, RAM, etc. realizes, and the bar code recovery method shown in this drawing as well as what was shown in drawing 1 in profile is equipped with the data table generation means 1 and the recovery means 2.

[0042] Here, the data table generation means 1 shall be a means to change and output the dot pattern of a bar code to a data table, and the thing of drawing 1 and the thing of the same configuration shall be used for it. Therefore, the detailed explanation is omitted here. However, especially the bar code specification treated with the gestalt of this 2nd operation shall consider "CODE39."

[0043] The above-mentioned recovery means 2 is a means which gets over based on the "bar width-of-face ratio" expressed with the size relation of the number of dots of same color bars in the location which constitutes the data table obtained with the data-table generation means 1, and which adjoined each other mutually, and consists of comparison means 2a, classification means 2b, and group decision means 2c and 2d of retrieval means in detail.

[0044] the above-mentioned comparison means 2a is a means to compare the size relation of the above-mentioned number of dots of same color bars (bar width of face) which adjoined each other mutually, and to ask for the bar width-of-face ratio (if for the former bar width of face to be larger than the latter bar width of face -- "size" -- if conversely small -- "smallness" -- for it to express like "**" if mutually the same).

[0045] The above-mentioned classification means 2b is a means to classify into two or more groups the dot pattern corresponding to each character contained in CODE39 based on the size relation (for example, for a bar width-of-face ratio (size, smallness, **) to put together) of the number of dots of same color bars in a mutually different location which constitutes this dot pattern (bar width of face). In addition, this group division is performed beforehand.

[0046] The above-mentioned group decision means 2c is a means to decide the group corresponding to the data table obtained with the data table generation means 1 based on the comparison results (combination of a bar width-of-face ratio etc.) by comparison means 2a out of two or more groups classified according to classification means 2b.

[0047] The 2d of the above-mentioned retrieval means is the means which discovers the character corresponding to the data table which searched the pattern table showing the dot pattern of a proper in each character within the group decided by group decision means 2c, and was obtained with the data table generation means 1. In addition, the above-mentioned pattern table is created beforehand.

[0048] Next, the bar code recovery method shown in drawing 4 is more concretely explained using drawing 5 , drawing 6 , and drawing 7 . In addition, drawing 5 and drawing 6 are flow charts which show processing of the bar code recovery method shown in drawing 4 , and drawing 7 is a data table, a black bar width-of-face ratio, a white bar width-of-face ratio, and drawing showing each example of a retrieval group.

[0049] In addition, step S11 in drawing 5 and drawing 6 is processing by the data table generation means 1, and steps S12-S24 are processings by the recovery means 2. [Step S11] The dot pattern of a bar code is first changed and outputted to a data table like the gestalt of implementation of the above 1st. As for the bar code of CODE39 treated with the gestalt of this 2nd operation, one character consists of five black bars and four white bars. For example, supposing the dot pattern of a certain character is "111111111111110000011 1111000001111110000 00000011111110000111 1111111111", as shown in drawing 7 (a), the data table "the black 12 white 5 black 6 white 5 black 6 white 10 black 6 white 4 black 13" corresponding to it will be generated. Henceforth, it gets over based on such a data table.

[0050] [Steps S12-S15] In the data table obtained at step S11, the number of dots of adjacent black bars (bar width of face) is compared, and the combination of the bar width-of-face ratio (size, smallness, **) of 1 character unit is searched for.

[0051] That is, first, at step S12, the 1st black bar width of face is compared with the 2nd black bar width of face, and it asks for the bar width-of-face ratio. In the data table shown in drawing 7 (a), since it is larger than the 2nd black bar width of face "6", a bar width-of-face ratio serves as [the 1st black bar

width of face "12"] "size."

[0052] Similarly, step S13 compares the 2nd black bar width of face and the 3rd black bar width of face, and at step S14, the 3rd black bar width of face is compared with the 4th black bar width of face, and by step S15, the 4th black bar width of face is compared with the 5th black bar width of face, and it asks for each bar width-of-face ratio. The black bar width-of-face ratio obtained from the data table shown in drawing 7 (a) becomes like drawing 7 (b), and the combination of these black bar width-of-face ratio serves as "size, **, **, and smallness."

[0053] [Steps S16-S18] In the data table obtained at step S11, the number of dots of adjacent white bars (bar width of face) is compared like the case of a black bar, and the combination of the bar width-of-face ratio (size, smallness, **) of 1 character unit is searched for.

[0054] That is, step S16 compares the 1st white bar width of face and the 2nd white bar width of face, and at step S17, the 2nd white bar width of face is compared with the 3rd white bar width of face, and by step S18, the 3rd white bar width of face is compared with the 4th white bar width of face, and it asks for each bar width-of-face ratio. The white bar width-of-face ratio obtained from the data table shown in drawing 7 (a) becomes like drawing 7 (c), and the combination of these whites bar width-of-face ratio serves as "**, smallness, and size."

[0055] [Steps S19-S21] The combination of the bar width-of-face ratio obtained at the above-mentioned steps S12-S18 investigates whether it is in agreement with which [in the retrieval group (the 1- 5th retrieval group) of CODE39 prepared beforehand], and is decided as an object of retrieval of only one group in agreement.

[0056] Although the above-mentioned retrieval group creates beforehand, here As this shows drawing 7 (d), the combination of a white bar width-of-face ratio "smallness, The combination of the 1st retrieval group and a white bar width-of-face ratio size and the character which is **" "**, The combination of the 2nd retrieval group and a white bar width-of-face ratio the character which are smallness and size" "**, A group division is carried out by classifying the character whose combination of the 4th retrieval group and a black bar width-of-face ratio is "**, **, **, and **" about the character whose combination of the 3rd retrieval group and a white bar width-of-face ratio is "size, **, and **" about the character which is ******" with the 5th retrieval group. Of course, you may classify according to the combination of others of a bar width-of-face ratio.

[0057] Thus, out of the created retrieval group, as it is the following, the group who considers as the object of retrieval is extracted to one. That is, the combination of the white bar width-of-face ratio obtained at the above-mentioned steps S16-S18 in step S19 investigates first whether it is in agreement with either the 1st or - the 4th retrieval group. When there is a retrieval group who was in agreement, it is step S21 and decides as an object of retrieval of the retrieval group who was in agreement.

[0058] on the other hand -- the above-mentioned step S19 -- setting -- the combination of a white bar width-of-face ratio -- the 1- when in agreement with neither of the 4th retrieval group, the combination of the black bar width-of-face ratio obtained at the above-mentioned steps S12-S15 investigates whether it is in agreement with the 5th retrieval group. When in agreement, it is step S21 and decides as an object of retrieval of the retrieval group who was in agreement. If not in agreement, since it does not correspond to all the retrieval group, either, processing is ended as an error.

[0059] [Steps S22-S23] The pattern table showing the dot pattern of a proper in each character is searched within one retrieval group decided at the above-mentioned step S21, and a character in agreement is discovered.

[0060] Although the above-mentioned pattern table is created beforehand the 1- shown in drawing 7 (d) -- the data table corresponding to each character belonging to the 4th retrieval group, since the combination of a black bar width-of-face ratio differs mutually even if it is in the same group As a pattern table of the character belonging to the 1st - the 4th retrieval group, what owned the combination pattern of the black bar width-of-face ratio corresponding to it as a table for every character is employable, for example. Moreover, since the combination of a white bar width-of-face ratio differs mutually, the data table corresponding to each character contained in the 5th retrieval group who showed drawing 7 (d) can adopt what owned the combination pattern of the white bar width-of-face ratio

corresponding to it as a table for every character as a pattern table of the character belonging to the 5th retrieval group, for example.

[0061] In the above-mentioned step S23, when a character in agreement is checked, it brings a recovery result per one character. If there is no match, processing will be ended as an error.

[0062] [Step S24] It restores to all the characters contained in a bar code by repeating the above steps S12-S23 until it reaches a tail from the head of a bar code.

[0063] According to the gestalt of the 2nd operation, since it was made to get over not based on the bar width of face itself [each] but based on the adjacent bar width-of-face ratio (size, smallness, **) of bar width of face, it does not need to be influenced [of the so-called contaminant data] like the dot transformation produced by the fine blemish which was expressed above, and which was made, for example on the bar code front face, and a very exact recovery can be realized.

[0064] In addition, although especially the gestalt of this 2nd operation showed the example at the time of adopting the bar code specification of CODE39, it is not necessarily limited to this, and if specification of each character is possible, based on the bar width-of-face ratio of a dot pattern, it is applicable also to the thing of other bar code specification.

[0065] Moreover, two bar width of face used as the object which asks for a bar width-of-face ratio does not necessarily need to adjoin each other, and should just be any or the comparison of the bar width of face of a different location.

<Gestalt of operation of the 3rd of this invention> drawing 8 is a flow chart which shows processing of the recovery method concerning the gestalt of operation of the 3rd of this invention.

[0066] The method of coping with a "void" (that out of which only 1 dot of whites came to the part which should be a black bar essentially) and a "spot" (that out of which only 1 dot of black came to the part which should be a white bar essentially) which were mentioned above is used for this recovery method. the case where it is the pattern with which "01" exists in the middle of "0" by which the dot pattern which read the bar code and was obtained especially followed continuous "1" -- namely, -- "... 111110100000 ... " -- it is -- a case is shown. The data processor with which this method as well as [for example,] the gestalt of old operation consists of CPU, a ROM, RAM, etc. realizes.

[0067] Hereafter, along with drawing 8 , it explains in detail.

[step S31] -- a dot pattern from the first -- "... 111110100000 ... " -- what is "11" about inner "01" (that is, "0" is a void) -- regarding -- a dot pattern -- "... 111111100000 ... " -- it gets over.

[0068] [Step S32] It checks whether the recovery performed at the above-mentioned step S31 has been successful, and when it succeeds, processing is ended at the time.

[step S33] -- the case where it is checked that a recovery is failure in the above-mentioned step S32 -- a dot pattern, shortly from the first -- "... 111110100000 ... " -- what is "00" about inner "01" (that is, "1" is a spot) -- regarding -- a dot pattern -- "... 111,110 million ... " -- it gets over.

[0069] [Step S34] It checks whether the recovery performed at the above-mentioned step S33 has been successful, and when it succeeds, processing is ended at the time. Since it is not a spot or a void on the other hand, either, when it is checked that a recovery is failure, processing is ended as an error.

[0070] thus, according to the gestalt of this 3rd operation, it is one gestalt of the dot pattern which can be regarded as a spot or a void existing -- "... 111110100000 ... " -- it receives and can respond effectively.

<Gestalt of operation of the 4th of this invention> drawing 9 is a flow chart which shows processing of the recovery method concerning the gestalt of operation of the 4th of this invention.

[0071] the case where the dot pattern which read the bar code and was especially obtained although the "spot" and the method of coping with a "void" were adopted is a pattern with which "010" exists in the middle of continuous "1" and continuous "1" like [this recovery method] the gestalt of the 3rd operation -- namely, -- "... 1111101011111 ... " -- it is -- a case is shown. The data processor with which this method as well as [for example,] the gestalt of old operation consists of CPU, a ROM, RAM, etc. realizes.

[0072] Hereafter, along with drawing 9 , it explains in detail.

[step S41] -- a dot pattern from the first -- "... 1111101011111 ... " -- what is "111" about inner "010" (that is, "0" is a void) -- regarding -- a dot pattern -- "... 1111111111111 ... " -- it gets over.

[0073] [Step S42] It checks whether the recovery performed at the above-mentioned step S41 has been successful, and when it succeeds, processing is ended at the time.

[step S43] -- the case where it is checked that a recovery is failure in the above-mentioned step S42 -- a dot pattern, shortly from the first -- "... 1111101011111 ... " -- what is "000" about inner "010" (that is, "1" is a spot) -- regarding -- a dot pattern -- "... 1111100011111 ... " -- it gets over.

[0074] [Step S44] It checks whether the recovery performed at the above-mentioned step S43 has been successful, and when it succeeds, processing is ended at the time. Since it is not a spot or a void on the other hand, either, when it is checked that a recovery is failure, processing is ended as an error.

[0075] thus, according to the gestalt of this 4th operation, it is another gestalt of the dot pattern which can be regarded as a spot or a void existing -- "... 1111101011111 ... " -- it receives and can respond effectively.

[0076] In addition, step S31, step S33, and step S41 and step S43 in drawing 9 in drawing 8 are mutually replaceable respectively. Moreover, the coping-with method for a spot and a void as shown in the gestalt of the above 3rd and the 4th implementation of the ability to apply to the conventional general bar code recovery method is possible also for applying to the gestalt of the above 1st and the 2nd implementation, though natural. However, it is not applied to bar code specification in which the bar of only 1 dot exists.

[0077] This invention is not limited to the gestalt of the above operation, and various configurations can be used for it within limits indicated to claim 1, claim 9, or 10.

[0078]

[Effect of the Invention] Since the processing which time amount which counts the number requires becomes unnecessary, shifting 1 dot of dot patterns at a time like before in order to get over based on the original data table generated from the dot pattern according to this invention, compared with the former, a recovery rate is sharply accelerable.

[0079] Moreover, a very exact recovery can be realized, without being influenced of contaminant data, if it is made to get over based on the bar width-of-face ratio of the above-mentioned data table. Moreover, it can respond effectively also to the dot pattern in which the spot and the void were contained.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]
本発明の第1の実施の形態に係る
バーコード復調方式の機能ブロック図

[Drawing 3]

* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The bar code recovery method characterized by having the data table generation means which a white bar and a black bar change into the data table having shown the dot pattern of the bar code arranged by turns in accordance with the array sequence with the number of dots corresponding to each bar width of face, and the recovery means which restores to said bar code based on the data table obtained with this data table generation means.

[Claim 2] A break means for said data table generation means to divide the dot pattern of said bar code into every n dot (for n to be two or more integers), and to generate two or more partial dot patterns, A storing means to store the number table of dots having shown the dot pattern which consists of n dots in accordance with the array sequence with the number of dots corresponding to each bar width of face for every class setting the white bar which constitutes this, and a black bar, By joining together mutually, carrying out sequential conversion of two or more partial dot patterns generated with said break means at the number of dots corresponding to each bar width of face using said number table of dots stored in this storing means The bar code recovery method according to claim 1 characterized by having a conversion means to generate said data table.

[Claim 3] Said recovery means is a bar code recovery method according to claim 1 or 2 characterized by having the pattern table having shown the dot pattern corresponding to each character with the number of dots like said data table, and getting over out of this pattern table by discovering the character corresponding to the data table obtained with said data table generation means.

[Claim 4] Said recovery means is claim 1 characterized by getting over based on the bar width-of-face ratio expressed with the size relation of the number of dots of same color bars in a mutually different location which constitutes the data table obtained with said data table generation means thru/or the bar code recovery method of any one publication of three.

[Claim 5] A comparison means by which said recovery means compares the size relation of the number of dots of said same color bars, A classification means to classify the dot pattern corresponding to each character into two or more groups based on the size relation of the number of dots of same color bars in a mutually different location which constitutes this dot pattern, A group decision means to decide the group corresponding to the data table obtained with said data table generation means based on the comparison result by said comparison means out of two or more groups classified according to said classification means, Within the group decided with this group decision means, the pattern table showing the dot pattern of a proper in each character is searched. The bar code recovery method according to claim 4 characterized by having the retrieval means which discovers the character corresponding to said data table obtained with said data table generation means.

[Claim 6] Said dot pattern is claim 1 characterized by being binary data which come to express the dot corresponding to a white bar and a black bar with "1" "0", respectively thru/or the bar code recovery method of any one publication of five.

[Claim 7] The bar code recovery method according to claim 6 characterized by adopting the direction which was successful either among the recovery which considers that ** "01" is what is "11", and

performs it, and the recovery performed by regarding it as what is "00" when the dot pattern of said bar code is a pattern with which "01" exists in the middle of "0" which followed continuous "1."

[Claim 8] The bar code recovery method according to claim 6 or 7 characterized by adopting the direction which was successful either among the recovery which considers that ** "010" is what is "111", and performs it, and the recovery performed by regarding it as what is "000" when the dot pattern of said bar code is a pattern with which "010" exists in the middle of continuous "1" and continuous "1."

[Claim 9] The bar code recovery method characterized by to adopt the direction which was successful either among the recovery which considers that ** "01" is what is "11", and performs it, and the recovery performed by regarding it as what is "00" when the dot pattern of the bar code which comes to arrange a white bar and a black bar by turns is a pattern with which "01" exists in the middle of "0" which followed continuous "1".

[Claim 10] The bar code recovery method characterized by to adopt the direction which was successful either among the recovery which considers that ** "010" is what is "111", and performs it, and the recovery performed by regarding it as what is "000" when the dot pattern of the bar code which comes to arrange a white bar and a black bar by turns is a pattern with which "010" exists in the middle of continuous "1" and continuous "1".

[Translation done.]

本発明の第1の実施の形態における、ドットパターン、
ドット数テーブル、及びデータテーブルの一例を示す図

0 1 1 1 1 1 0 0 1 1 1 1 1 1 1 0 0 1 0 0
　└①┘ └②┘ └③┘ └④┘ └⑤┘
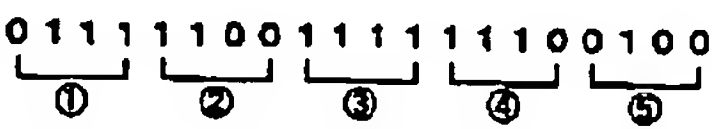
(a)

ドットパターン	白	黒	白	黒
0000	4	—	—	—
0001	3	1	—	—
0010	2	1	1	—
0011	2	2	—	—
0100	1	1	2	—
0101	1	1	1	1
0110	1	2	1	—
0111	1	3	—	—

ドットパターン	黒	白	黒	白
1000	1	3	—	—
1001	1	2	1	—
1010	1	1	1	1
1011	1	1	2	—
1100	2	2	—	—
1101	2	1	1	—
1110	3	1	—	—
1111	4	—	—	—

(b)

白 バー ドッ ト数	黒 バー ドッ ト数	白 バー ドッ ト数	黒 バー ドッ ト数	‥‥‥	白 バー ドッ ト数	黒 バー ドッ ト数	白 バー ドッ ト数	黒 バー ドッ ト数
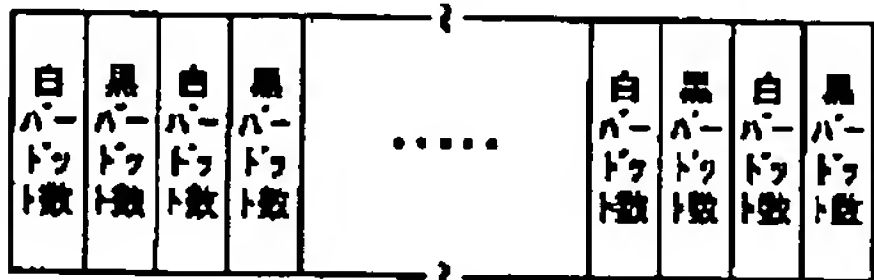
（[白1 黒5 白2 黒7 白2 黒1 白2]）

(c)

[Drawing 2]

図1に示したバーコード復調方式の
処理を示すフローチャート


```
                    ┌──────────────┐
                    │    Start     │
                    └──────┬───────┘
                           │
        ┌──────────────────┤
        │         ┌─────────────────────────────┐
        │         │ ドットパターンからnドット取り出す      │── S1
        │         └──────────────┬──────────────┘
        │         ┌─────────────────────────────┐
        │         │ 取り出したnドットをキーとし          │── S2
        │         │ ドット数テーブルを検索する           │
        │         └──────────────┬──────────────┘
        │         ┌─────────────────────────────┐
        │         │ ドット数テーブルからデータを導く        │── S3
        │         └──────────────┬──────────────┘
        │                        │
        │              前のドットパターンとの関係が         No
        │              「白→白」または「黒→黒」    ─────────┐   S4
        │                  の連続?                       │
        │                   Yes                          │
        │         ┌─────────────────────────────┐       │
        │         │ 黒ドット数または白ドット数の足し込みを行い │── S5  │
        │         │ データをデータテーブルに結合する        │       │
        │         └──────────────┬──────────────┘       │
        │         ┌─────────────────────────────┐       │
        │         │ データをデータテーブルに結合する        │── S6 ◄┘
        │         └──────────────┬──────────────┘
        │   No                   │
        └──────────       ドットパターン末尾?    ──────── S7
                                 Yes
                  ┌─────────────────────────────┐
                  │ データテーブルを基にバーコードの復調を行う │── S8
                  └──────────────┬──────────────┘
                    ┌──────────────┐
                    │     End      │
                    └──────────────┘
```
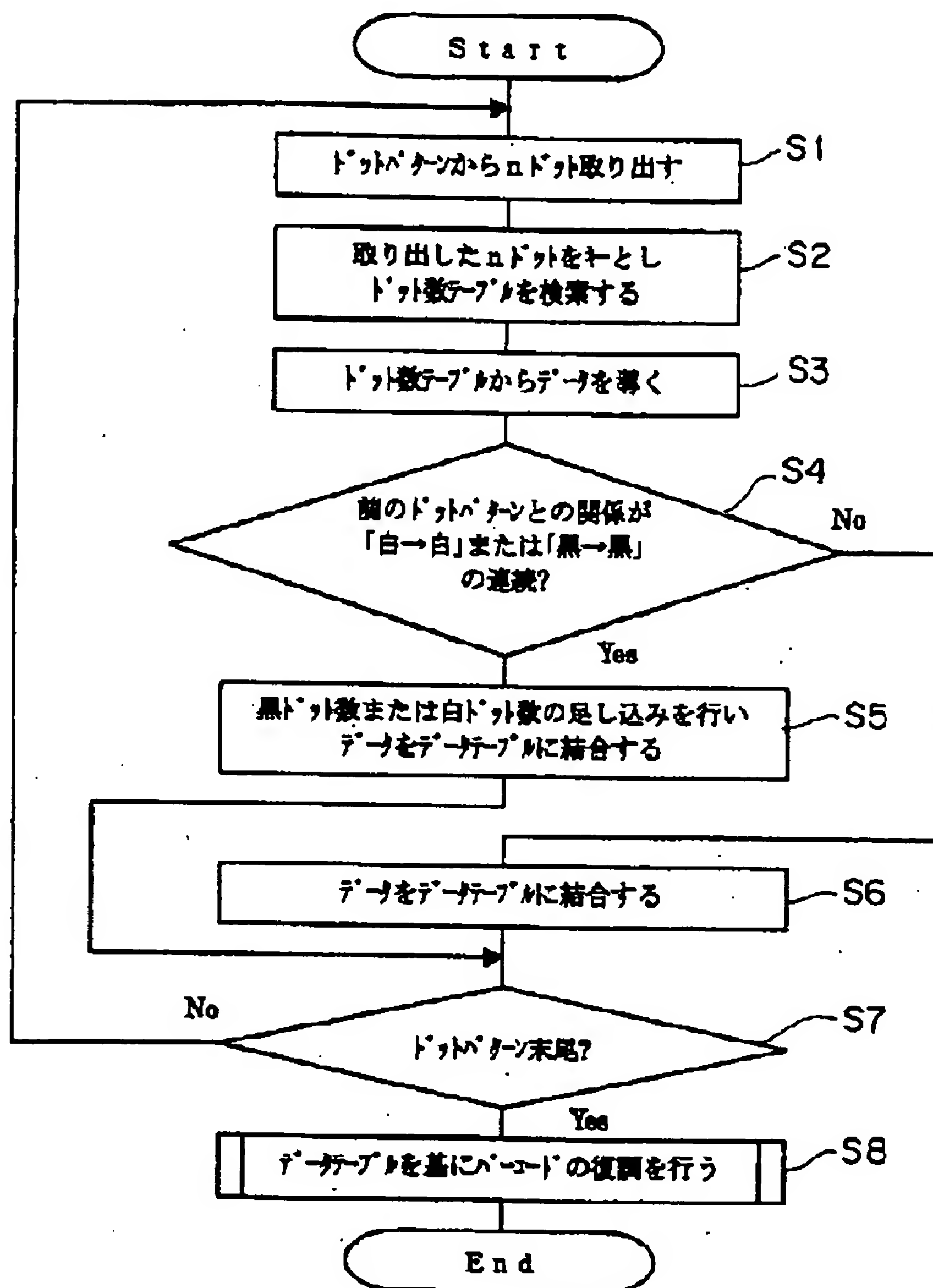
[Drawing 4]

本発明の第2の実施の形態に係る
バーコード復調方式の機能ブロック図

復調結果

検索手段　2d

グループ
確定手段　2c

分類手段　2b

比較手段　2a

復調手段

データテーブル

データテーブル
生成手段　1

ドットパターン
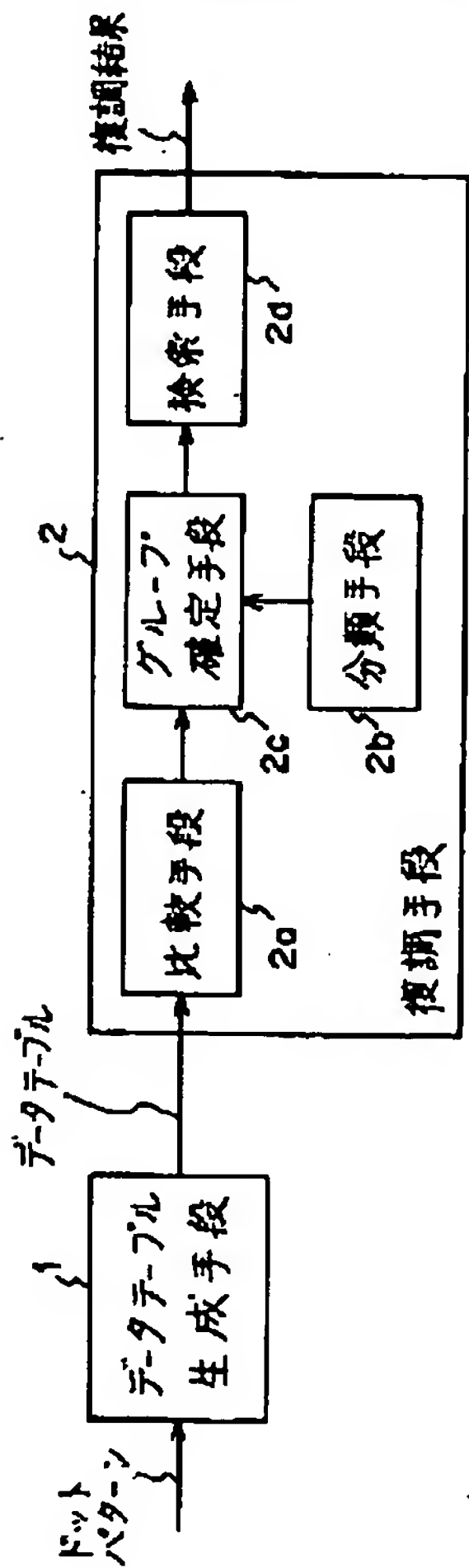
[Drawing 5]

図4に示したバーコード復調方式の処理の一部分を
示すフローチャート

Start

ドットパターンを データテーブル に変換する ~S11

2

第1黒バー幅と第2黒バー幅を比較する ~S12

第2黒バー幅と第3黒バー幅を比較する ~S13

第3黒バー幅と第4黒バー幅を比較する ~S14

第4黒バー幅と第5黒バー幅を比較する ~S15

第1白バー幅と第2白バー幅を比較する ~S16

第2白バー幅と第3白バー幅を比較する ~S17

第3白バー幅と第4白バー幅を比較する ~S18

S19

Yes

白バー幅比の組合せが第1～4検索
グループの何れかと一致する?

No

S20

Yes

黒バー幅比の組合せが第5検索
グループと一致する?

No

1

エラー終了
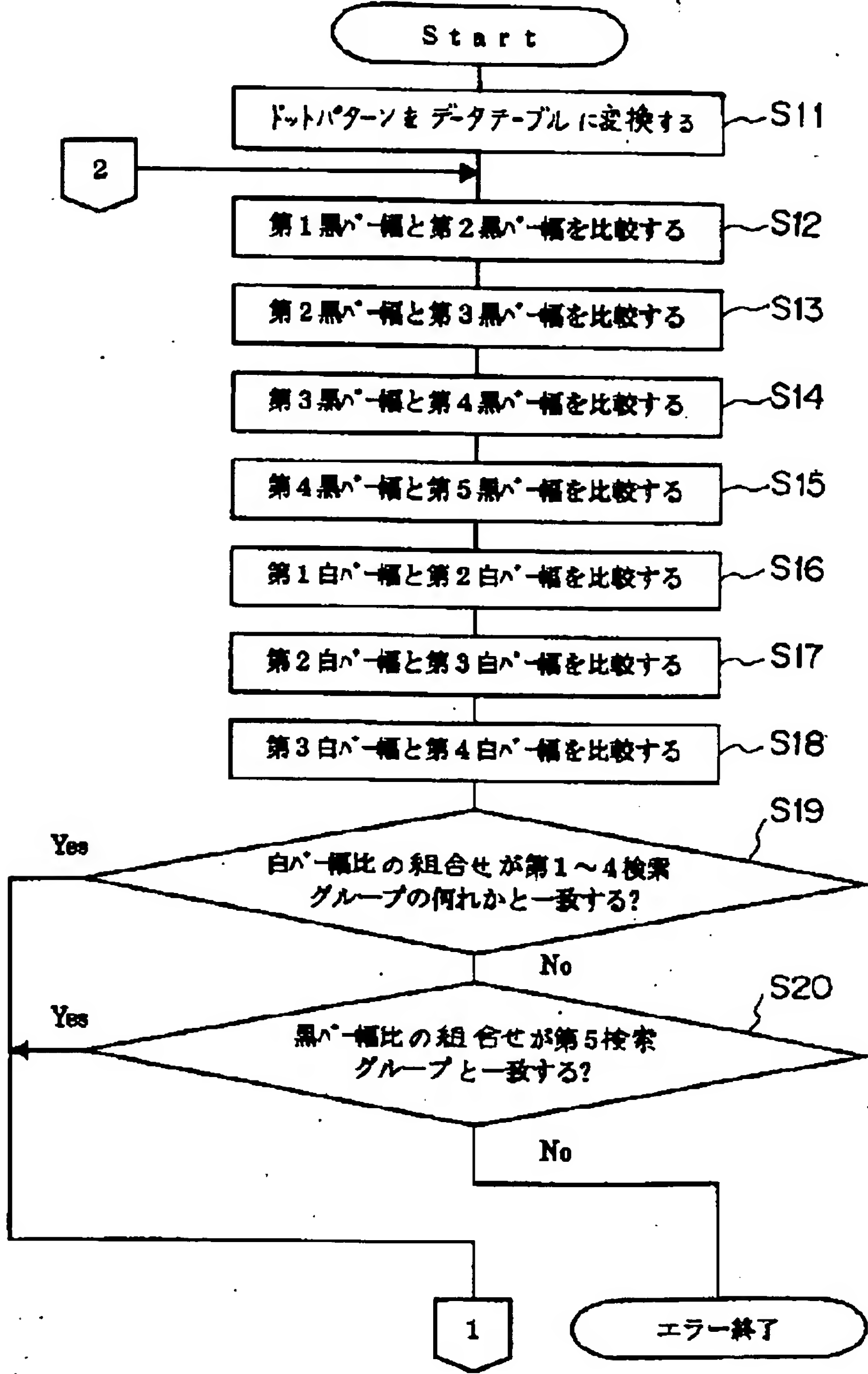
[Drawing 6]

図4に示したバーコード復調方式の処理の
他の部分を示すフローチャート

```
                    ┌─────┐
                    │  1  │
                    └──┬──┘
                       │
        ┌──────────────────────────┐
        │      検索グループ確定       │────── S21
        └──────────────┬───────────┘
                       │
        ┌──────────────────────────┐
        │  検索グループ内でキャラクタ固有の  │────── S22
        │    パターンテーブルと比較      │
        └──────────────┬───────────┘
                       │        S23
                     ╱─┴─╲
                   ╱       ╲          No
                 ╱   一致?    ╲───────────────┐
                  ╲         ╱                 │
                   ╲       ╱                  │
                     ╲─┬─╱                    │
                       │ Yes      S24         │
          No         ╱─┴─╲                    │
    ┌─────┐   ╱       ╲                   │
    │  2  │◄────  バーコード末尾?  ╲              │
    └─────┘     ╲       ╱                   │
                   ╲       ╱                  │
                     ╲─┬─╱                    │
                       │ Yes                  │
                 ┌──────────┐      ┌──────────┐
                 │   End    │      │  エラー終了  │
                 └──────────┘      └──────────┘
```
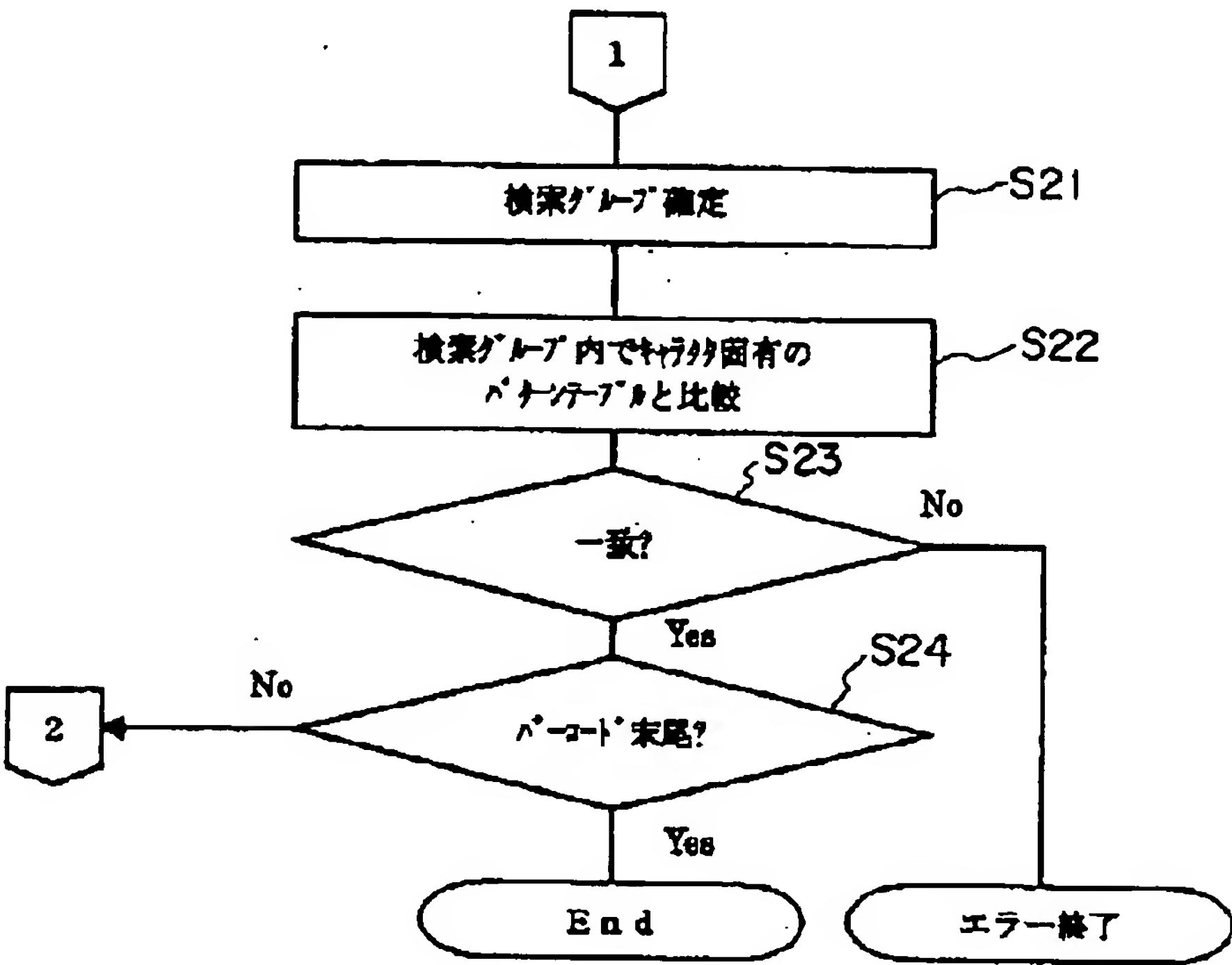
[Drawing 7]

本発明の第2の実施の形態における、データテーブル、黒バー幅比、
白バー幅比、及び検索グループのそれぞれの一例を示す図

[黒12白5黒6白5黒6白10黒6白4黒13]

(a)

第1黒バー幅12と第2黒バー幅6 の比較・・・大
第2黒バー幅6 と第3黒バー幅6 の比較・・・同
第3黒バー幅6 と第4黒バー幅6 の比較・・・同
第4黒バー幅6 と第5黒バー幅13の比較・・・小

(b)

第1白バー幅5 と第2白バー幅5 の比較・・・同
第2白バー幅5 と第3白バー幅10の比較・・・小
第3白バー幅10と第4白バー幅4 の比較・・・大

(c)

	黒バー幅比	白バー幅比	キャラクタ
第1検索グループ	――――	小大同	0, 1, 2, 3, 4, 5, 6, 7, 8, 9,
第2検索グループ	――――	同小大	A, B, C, D, E, F, G, H, I, J
第3検索グループ	――――	同同小	K, L, M, N, O, P, Q, R, S, T
第4検索グループ	――――	大同同	U, V, W, X, Y, Z, ―, (カンマ), (スペース), *
第5検索グループ	同同同同	――――	$, /, +, %

(d)

[Drawing 8]

本発明の第3の実施形態に係る
復調方式の処理を示すフローチャート

```
                    ┌─────────────┐
                    │   Start     │
                    └──────┬──────┘
                           │                        S31
   ┌───────────────────────┴───────────────────────┐
   │ ・・・111110100000・・・として復調を行う         │
   │     └─┬─┘└────┬────┘                           │
   │       黒        白                             │
   └───────────────────┬────────────────────────────┘
                       │                   S32    Yes
                  ◇────┴────◇──────────────────────────┐
                  │ 復調成功? │                          │
                  ◇─────────◇                           │
                       │ No                      S33     │
   ┌───────────────────┴────────────────────────────┐   │
   │ ・・・11110100000・・・として復調を行う           │   │
   │     └─┬┘└────┬────┘                             │   │
   │       黒       白                              │   │
   └───────────────────┬────────────────────────────┘   │
                       │              S34      Yes       │
                  ◇────┴────◇──────────────────────────→│
                  │ 復調成功? │                          │
                  ◇─────────◇                           │
                       │ No                              │
            ┌──────────┘                    ┌───────────┘
     ┌──────┴──────┐              ┌──────────┴──────┐
     │  エラー終了  │              │     End         │
     └─────────────┘              └─────────────────┘
```
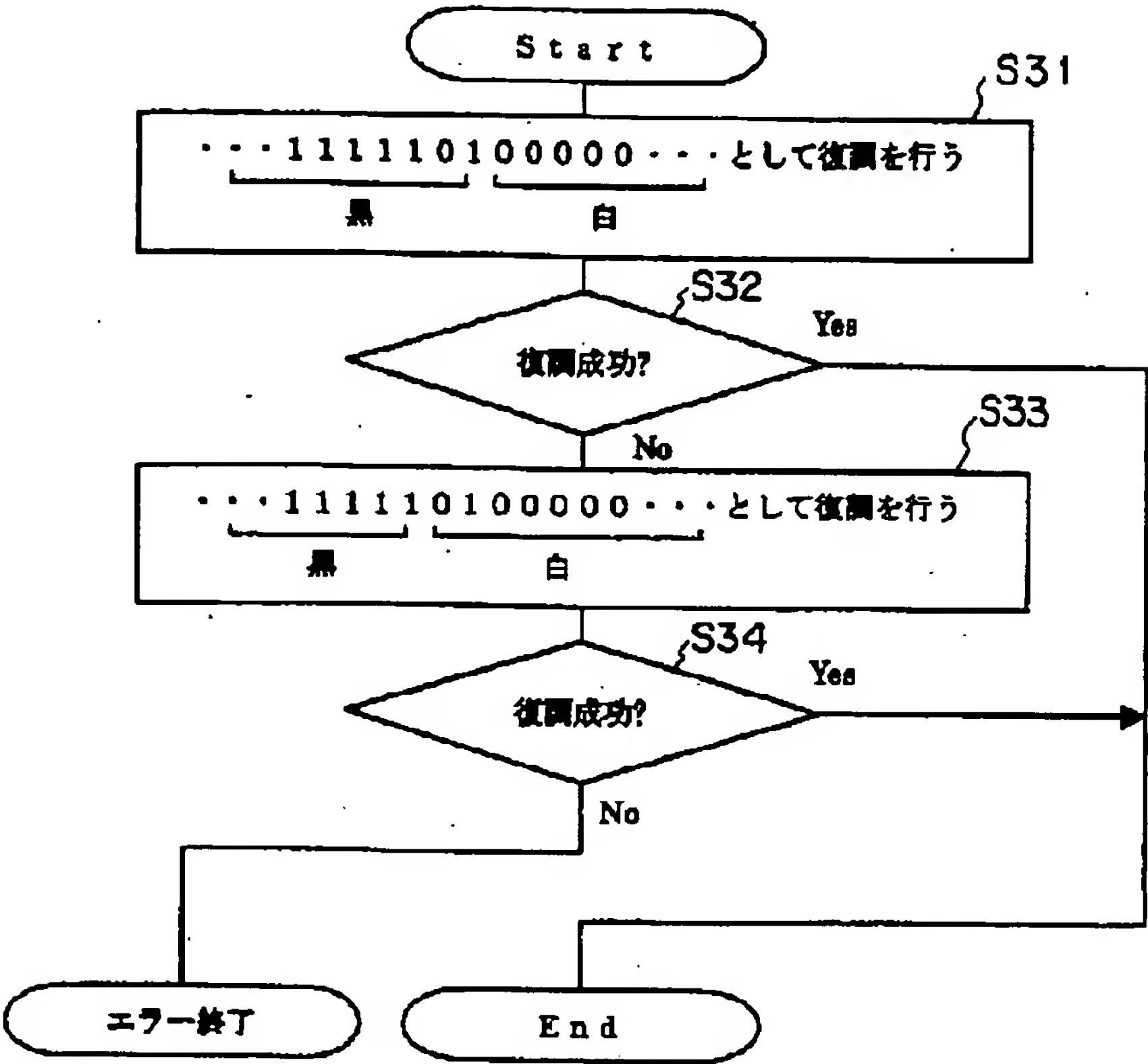
[Drawing 9]

本発明の第4の実施の形態に係る
復調方式の処理を示すフローチャート

Start

・・・1111101011111・・・として復調を行う　　S41
黒

復調成功?　　S42　　Yes

No

・・・1111101011111・・・として復調を行う　　S43
黒　　白　　黒

復調成功?　　S44　　Yes

No

エラー終了　　　　　End

[Translation done.]